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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR    | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/071,405   | 02/08/2002  | Frans Andreas Gerritsen | NL010106            | 1656             |
| 24737  | 7590        | 02/02/2005              | EXAMINER            |                  |
| PHILIPS INTELLECTUAL PROPERTY & STANDARDS<br>P.O. BOX 3001<br>BRIARCLIFF MANOR, NY 10510 |             |                         | KRONENTHAL, CRAIG W |                  |
|  |             |                         | ART UNIT            | PAPER NUMBER     |
|  |             |                         | 2623                |                  |

DATE MAILED: 02/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/071,405

Applicant(s)

GERRITSEN ET AL.

Examiner

Craig W Kronenthal

Art Unit

2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 08 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 February 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 06/18/02,02/08/02.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to because in Figure 1 reference number 3 does not point to what is believed to be the cut plane. Also in Figure 3 reference number 5 does not point to the reconstructed slice it is believed to label. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-4 are rejected under 35 U.S.C. 102(b) as being anticipated by Shiffman et al. (PN 6,424,732). (hereinafter Shiffman)

Regarding Claim 1: Shiffman discloses a method of processing images, in which:

- Individual images succeed one another in a direction of succession (col. 6 lines 8-10). [The individual images are the 2-dimensional images (Fig. 2, 21, 26, and 32) and the direction of succession is the time dimension as is inherent in CT imaging.]
- A multi-dimensional data set is constructed from the individual images (col. 8 lines 4-5). [The multi-dimensional data set is the 3-dimensional volume (Fig. 8, 42) that results from stacking the 2-dimensional images (21, 26, 32).]
  - which multi-dimensional data set assigns data values to positions in a multi-dimensional space (col. 6 lines 61-62). [The image volume (42) assigns intensity levels to all points in a 3-dimensional space.]
  - which multi-dimensional space is set up by the direction of succession and two directions parallel to the surface of the individual images (Fig. 8).  
[Figure 8 shows the direction of succession which is represented by the

arrow to the left of the image volume (42). It also shows the cross sections belonging to the different 2-dimensional images (21, 26, 32).

Observing this figure it is clear that the cross sections are stacked on top of one another in the direction of succession. The two directions parallel to the surface of the individual images are the two directions of the 2-dimensional images (21, 26, 32) which are not shown but understood to be the direction across the width of the figure and the direction into the figure.]

- A slice through the multi-dimensional data set is reconstructed along a cut plane through the multi-dimensional space (col. 8 lines 15-17). [The reconstructed slices are represented by the 2-dimensional planes {note these are referred to as 2-dimensional planes and not 2-dimensional images (21, 26, 32)} as shown in Figure 9.]
- The direction of the cut plane has a component in the direction of succession (col. 8 line 17). [The cut plane is the direction in which the image volume (42) is sliced. Shiffman discloses that the slicing can be done in any direction, which means the direction of the cut plane can have a component in the direction of succession. In figure 9, the slices in the top left have a cut plane in the Y-Z directions, the slices in the top right have a cut plane in the X-Z directions, and the bottom slices have a cut plane in the X-Y directions.]
- A region of interest is located on the basis of the cut plane (col. 9 lines 21-25). [The region of interest is the object that is composed of the cross-sections

ascertained from the 2-dimensional planes which are the slices defined by the cut plane.]

The analogous arguments of claim 1 are applicable to claims 7, 8, and 9.

Regarding Claim 2: A method of processing images as claimed in claim 1, in which:

- Segmentation of a region of interest from the one or more relevant images is performed in one or more of the individual images (col. 8 lines 20-28). [The images are segmented by deciding which cross-sections belong to which objects. Multiple objects (Fig. 8, 13, 14, and 11 {which should be 16}) may be in one region of interest (Fig. 8, 42).]
- Such segmentation is performed on the basis of information in the reconstructed slice along the cut plane through the multi-dimensional data set (col. 8 lines 34-37). [The segmentation is done based on the results of modeling cross-sections with functions that allow for comparison. Area is the type of information in the reconstructed slice or 2-dimensional plane that is used for segmentation.]

Regarding Claim 3: Shiffman discloses a method of processing images as claimed in claim 2, in which:

- An edge is located in the reconstructed slice (col. 8 lines 37-40). [The contours of the cross-sections within the 2-dimensional planes are determined.]
- The segmentation of the region of interest in the one or more images is performed on the basis of the location of the edge found in the relevant image

(col. 9 lines 1-6). [The contours are used to find the area of the cross-sections and based on the area the cross-sections are grouped together to segment the region of interest.]

Regarding Claim 4: Shiffman discloses a method of processing images as claimed in claim 3, in which:

- Respective slices through the multi-dimensional data set are reconstructed along a plurality of cut planes through the multi-dimensional space (col. 8 lines 15-17). [The reconstructed slices are represented by the 2-dimensional planes {note these are referred to as 2-dimensional planes and not 2-dimensional images (21, 26, 32)} as shown in Figure 9.]
- The directions of the individual cut planes have components in the direction of succession (col. 8 line 17). [The cut plane is the direction in which the image volume (42) is sliced. Shiffman discloses that the slicing can be done in any direction, which means the direction of the cut plane can have a component in the direction of succession. In figure 9, the slices in the top left have a cut plane in the Y-Z directions, the slices in the top right have a cut plane in the X-Z directions, and the bottom slices have a cut plane in the X-Y directions.]
- Individual edges are tracked in the individual slices (col. 6 lines 43-45). [The isolabel contours of the cross-sections within the 2-dimensional planes are tracked by intensity thresholding.]

- And the segmentation of the region of interest in the one or more images is performed on the basis of the individual locations of the respective edges found in the relevant image (col. 9 lines 1-6). [The contours are used to find the area of the cross-sections and based on the area the cross-sections are grouped together to segment the region of interest.]

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shiffman in view of Han et al. (PN 5,457,754). (hereinafter Han)

Regarding Claim 5: Shiffman discloses a method of processing images as claimed in claim 4. Shiffman discloses the finding the boundaries of a region of interest but assumes that this boundary would be continuous and therefore does not disclose the use of interpolation. However, Han discloses a method for automatic contour extraction of a cardiac image in which:

- A boundary of the region of interest is derived by interpolation between the individual locations in the relevant image of the respective edges found (col. 16



lines 19-23). [Interpolation is used to create a continuous boundary as shown in Figures 28a, 28b, and 28c.]

It would be obvious to one skilled in the art to modify Shiffman with the process of interpolation as taught by Han because Shiffman stresses the importance of accurately determining the contours (col. 8 lines 40-44). Furthermore one would be motivated to make this modification to improve the accuracy of the boundary because as Han explains noise and discontinuities negatively impact the determining of the boundary. Han explains how interpolation is used in medical imaging, specifically of the heart, to account for these factors.

Regarding Claim 6: Shiffman discloses a method of processing images as claimed in claim 5. Shiffman discloses the finding the boundaries of a region of interest but assumes that this boundary would be continuous and therefore does not disclose the use of interpolation. However, Han discloses a method for automatic contour extraction of a cardiac image in which:

- The interpolation is performed inter alia on the basis of a priori information concerning the region of interest (23-26). [The a priori information is used to ensure the contours are not just continuous but meaningful as well.]

### ***Conclusion***

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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- Cline et al. (PN 6,438,403) is cited for teaching a method and apparatus for cardiac analysis using four-dimensional connectivity including locating a region of interest.
- Yamagishi (PN 5,297,215) is cited for teaching an apparatus and method of displaying medical images of sliced tissue.
- Vining (PN 5,782,762) is cited for teaching a method for producing a three dimensional rendering of body organs through segmentation of two dimensional slices.
- Parker et al. (PN 6,169,817) is cited for teaching a method for four dimensional reconstruction including edge detection and segmentation.
- Tuy et al. (PN 5,170,347) is cited for teaching a method of three dimensional reconstruction of a region of interest from slices on the basis of boundary detection.
- Sheehan et al. (PN 5,734,739) is cited for teaching a method for determining the contour of an organ using multiple image frames of the organ.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig W Kronenthal whose telephone number is (703) 305-8696. The examiner can normally be reached on 8:00 am - 5:00 pm / Mon. - Fri..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 306-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

01/27/05  
CWK

**MEHRDAD DASTOURI**  
**PRIMARY EXAMINER**

*Mehrdad Dastouri*